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THE FOSSIL MAMMALS OF THOMAS FARM, GILCHRIST COUNTY, FLORIDA

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The sedimentary rocks of North America contain, as is well known, a series of fossiliferous deposits which give a remarkably complete story of the history of land mammals throughout the entire extent of the Cenozoic, or Age of Mammals. There is, however, one major imperfection in this story. It is almost entirely a history of life in the western half of the country. There are, it is true, abundant remains of Pleistocene animals from the superficial deposits of almost every state in the union. But the Pleistocene is merely a short late chapter in Cenozoic history, and constitutes but about one percent of the total. Back of that, for the entire history of the Tertiary period, we have almost no fossils from the eastern half of the continent. This is unfortunate. Today, eastern and western faunas differ to a degree, and the same might have been true of earlier faunas. That the contrast between east and west might have been much greater than today is suggested by the fact that for much of this long period of fifty million years or more the Mississippi Valley was not dry land but a great arm of the sea which swept north to partially divide North America into two sub-continents.

The reason for the paucity of the eastern fossil record is readily seen. In the West materials washed out from the Rockies and other youthful mountain systems onto the plains formed masses of continental sediments in which remains of land animals might be entombed. The eastern mountains are older. Tertiary deposits are absent in the old, flat plains of the Midwest. Along the Atlantic and gulf coastal plains

Tertiary sediments are abundant; but they are dominantly marine in nature, and contain almost no land animals.

Florida forms the one exception to this dearth of Tertiary continental records in eastern America. During the earlier epochs of the Age of Mammals this region appears to have remained below sea level, and the only faunas are marine. But with the Miocene, northern Florida began to emerge from the sea and for the later stages of the Tertiary the state gives promise of yielding a record of land life against which we can check that already known from the western states.

The first remains of mammals from these beds were discovered more than half a century ago, and other finds have been reported from time to time at various localities. For the most part, however, the remains are fragmentary, and little intensive work has been done and published upon. The one exception is the bone deposit of Thomas Farm in Gilchrist County, some forty-five miles west of Gainesville and five miles northeast of the little town of Bell.

In the year 1930, as Mr. J. Clarence Simpson of the Florida Geological Survey was traveling cross-country through the piney woods of Gilchrist County, he spied a mound of earth which had been thrown out in the excavation of a well on an old farm, long since abandoned. Fragments of mammal bone were evident in the material. Later he returned and dug an exploratory trench near the well, from which a number of specimens were recovered. These were sent for identification to the American Museum of Natural History in New York, and described in papers published in 1932 by G. G. Simpson and A. E. Wood. It was planned by the Survey to continue this work, but their limited budget and the pressure of work of direct economic application forced them to abandon the project.

There the matter rested until 1938, when the late Dr. Thomas Barbour, then Director of the Museum of Comparative Zoölogy at Harvard, visited Tallahassee and saw the specimens. Tom Barbour was a lover of Florida and of fossil bones; here the two interests were combined, and he resolved to investigate the deposit. The site —the old Raeburn Thomas farm—was relocated. A forty acre tract containing the bonebed was purchased from the bank which owned the farm and the deed given to the University of Florida, with the understanding that both Harvard and the State Geological Survey be allowed to excavate there when they desired. Since then one or more members of the Museum of Comparative Zoölogy staff have spent a portion of each winter excavating there, except for part of the war

period. Dr. Theodore E. White has in general been in charge of the work, and has usually been aided by Mr. John Henry Thomas, a native of Gilchrist County who lives at the site. Mr. and Mrs. William Schevill were the workers at the "dig" the first season; in the autumn of 1947 Mr. Stanley Olsen took the place of Dr. White, then engaged in government work. White has published a series of papers (1940, 1941, 1942, 1942a, 1947) on his finds; Barbara Lawrence (1943) has described bat remains; A. E. Wood (1947) further rodent materials, and Alexander Wetmore (1943) bird remains.

In his paper of 1942 White has given a description of the bone deposit. The bones are always found separate, never as associated skeletons, and are sprinkled rather evenly through many areas of the series of sands and clays which make up the bulk of the material. A depression which may be due to a sinkhole is located nearby, and this appears to have led to the suggestion that the deposit itself is a sinkhole filling (G. G. Simpson 1932; Cooke 1945: 119-120). This present depression, however, appears to bear no relation to the bone deposit and, as can be seen from White's account, the sediments are not of the sort expected in a sink fill but rather those of a river channel. Because of the scattered nature of the material, the customary method of excavating in large blocks to be worked out in the laboratory is impractical, and since bones may be found at any point the main method of excavating is a slow scraping away of the exposed surface of the bed, layer by layer, an inch at a time; a grapefruit knife is a suitable tool. The bones encountered are usually delicate and frequently crushed or fractured and hence are usually removed in small burlap-and-plaster packages. Borings indicate that the bone layer extends to a depth of forty feet and that the fossiliferous layer covers well over an acre of ground. Excavation so far has been confined to a trench about 15 feet deep at its deepest point, and with an area of roughly 15 x 40 feet. It is obvious that only a beginning has been made in the excavation possible. One may calculate roughly that the bone deposit includes at least 2,000,000 cubic feet of workable material and, since only a small amount can be excavated in a day, that the pit would not be completely excavated until approximately 2,000 man-years of labor had been expended. It is obvious that the site will not be exhausted for some time to come.

From the works of G. G. Simpson, T. E. White, B. Lawrence, and A. E. Wood, the mammalian faunal list can be assembled:

Order CHIROPTERA

Family Vespertilionidæ

Suaptenos whitei

Miomyotis floridanus

Order CARNIVORA

Family Mustelidæ

Aelurocyon spissidens

Oligobunis floridanus

Mephititaxus ancipidens

Family Canidæ

Aelurodon johnhenryi

Amphicyon intermedius

Amphicyon longiramus

?*Daphœnus caroniavorus*

Nothocyon insularis

Paradaphœnus nobilis

Paradaphœnus tropicalis

Parictis bathygenus

Tomarctus canavus

Tomarctus thomasi

Order ARTIODACTYLA

Family Tayassuidæ

Floridachœrus olseni

Family Camelidæ

Oxydactylus floridanus

Family Hypertragulidæ

Floridatragulus barbouri

Floridatragulus dolichanthereus

Hypermekops olseni

Family Protocerotidæ

Syndyoceras australis

Synthetoceras douglasi

Family Nothokemadidæ

Nothokemas grandis

Family Cervidæ

Blastomeryx (*Parablastomeryx*) *floridanus*

Machæromeryx gilchristensis

Order PERISSODACTYLA

Family Equidae

Anchitherium clarencei

Merychippus gunteri

Merychippus westoni

Miohippus sp.

Parahippus barbouri
Parahippus blackbergi
Parahippus leonensis

Order RODENTIA

Family Heteromyidæ

Proheteromys floridanus
Proheteromys magnus

In addition, A. E. Wood (1947) recognizes from postcranial material, the presence of a cricetid rodent, and there are present two rhinoceroses, to be described by H. E. Wood. Apart from the mammals, there are present an alligator, represented by a good skull (White 1942a) as well as numerous scutes, fragmentary remains of large tortoises, and three birds (Wetmore 1943).

The known fauna includes members of the four mammalian orders —carnivores, even- and odd-toed ungulates, and rodents—whose remains are most common in other American mid-Tertiary deposits, as well as bat remains. There are fragmentary specimens of three mustelids, one of which (*Mephititaxus*) is not known elsewhere. Dogs are numerous. Several (*Nothocyon*, *Tomarctus*, ?*Daphœnus*) are representative of the "main line" of evolution leading toward the typical modern canids; *Amphicyon* and *Paradaphœnus* are "bear-dogs"; *Parictis* may be remotely related to true bear ancestry; the *Aelurodon* specimen, if correctly identified generically, is a precursor of a group of peculiar dome-headed dogs found in later times in Florida as well as the West.

Among artiodactyls, there is a peccary typical of the Miocene, although placed in a genus—*Floridachœrus*—distinct from those of the West, a typical camel, *Oxydactylus*, and two representatives—*Blastomeryx* (*Parablastomeryx*) and *Machæromeryx*—of a characteristic group of American Tertiary "deer." Most interesting are the members of the hypertraguloids, a group of rather primitive ruminants, now extinct, which in the Tertiary of this country played the role occupied in the Old World by fossil and living members of the musk-deer group (traguloids). Five genera have been identified; two (*Syndyoceras* and *Synthetoceras*) are genera known from western America; the others—*Floridatragulus*, *Hypermekops* and *Nothokemas*—are, as far as known, peculiar to Florida. All three are peculiarly long-snouted forms.

Of the Perissodactyla, the rhinoceroses are represented by two forms as yet undescribed, and by numerous horses. The Equidæ are the most abundant of animals in the deposit. Other mammals, as we have noted, are present in a variety of forms, but the material in most instances is

limited in quantity. The horses make up 80 to 90 percent of the mass of known material, and in excavation one assumes, upon locating a specimen, that it is a horse unless proved otherwise. Rarities among the horses are remains of the primitive genus *Miohippus* and the larger, but persistently primitive genus *Anchitherium*. A small slender horse of more advanced nature, moderately abundant, is a type usually included in the genus *Archæohippus*, but which White prefers to include in the genus *Parahippus* as *P. blackbergi*. This last genus occupies a crucial position in horse evolution, as exhibiting a transition between primitive browsing horses and the more progressive plains-dwelling grazers of the later Cenozoic. Typical members of *Parahippus* are the common horses of the deposit. A percentage of the horse dentitions show a somewhat more advanced condition suggestive of the genus *Merychippus*, derived from *Parahippus*. It is difficult to draw a boundary between specimens assigned to these two forms. It may well be that, as both Simpson and White suggest, we are here witnessing an actual evolutionary transition from one genus to the other; the accumulation of a considerable amount of material from this site gives the possibility of a quantitative study of the situation.

The known rodents—two species of the primitive pocket mouse, *Proheteromys*, and an indeterminate cricetid—are surely only a small fraction of the rodent fauna of Florida at the time.

There is no question but that the age of the fauna is Lower Miocene, the provincial age termed Arikareean in the Wood report (Wood *et al.* 1941). Of the twenty-six mammalian genera present, seven are peculiar to Florida. They are hence of little value in correlation, although offering no obstacle to the conclusion as to age. The occurrence of the remaining nineteen in other North American deposits may be tabulated.

At least seven of these genera, and possibly eight, are known elsewhere in this continent only in the Arikareean. Four others are found in the Oligocene, but are also reported from the Arikareean of the West. Still another four are present in the later Miocene, but are Lower Miocene as well in their occurrence in the Rocky Mountain and Great Plains area.

So far, agreement with an early Miocene interpretation of age is excellent, and any other interpretation appears out of the question. There remain four stumbling blocks, in the shape of genera stated to be present here but not recorded in the abundant Arikareean of the West —*Aelurodon*, *Daphœnus*, *Synthetoceras* and *Merychippus*. The matter is not, however, serious. *Aelurodon* is a dog otherwise known only from

	Oligocene			Miocene			Pliocene		
	L.	M.	U.	L.	M.	U.	L.	M.	U.
Aelurocyon	..	..	..	x	..	..	..	..	..
Oligobunis	..	..	..	x	..	..	..	..	..
Aelurodon	..	..	..	..	..	x	x	..	..
Amphicyon	..	..	x	x	x	x	x	..	..
Daphœnus	x	x	x	..	..	..	..	..	..
Nothocyon	x	x	x	x	..	..	..	..	..
Paradaphœnus	..	..	..	x	..	..	..	..	..
Parictis	x	x	x	x	..	..	..	..	..
Tomarctus	..	..	..	x	x	x	x	..	..
Oxydactylus	..	..	..	x	..	..	..	..	..
Syndyoceras	..	..	..	x	..	..	..	..	..
Synthetoceras	..	..	..	..	..	..	x	..	..
Blastomeryx	..	..	..	x	x	x	x	x	..
Machœromeryx	..	..	..	x	..	..	..	..	..
Anchitherium	..	..	..	x	..	..	..	..	..
Merychippus	..	..	..	..	x	x	..	..	..
Miohippus	..	..	x	x	..	..	..	..	..
Parahippus	..	..	..	x	x	x	..	..	..
Proheteromys	..	..	..	x	?	..	..	..	..

the late Miocene and early Pliocene. Its supposed representative here is a jaw which, as White notes, is placed in that genus only as a matter of convenience. As he states, the specimen does not agree fully with the definition of *Aelurodon* and may represent an earlier stage in the evolution of this dog "phylum"; a comparable genus is found in the western Arikareean. *Daphœnus* is a characteristic Oligocene dog genus. The sole specimen assigned to it here is poor and fragmentary, and while it may represent an unusually late survivor of *Daphœnus*, the generic assignment is stated by White to be provisional only. *Synthetoceras* is a grotesquely horned protocerotid artiodactyl of the western Pliocene. The Thomas Farm specimen assigned to it is represented only by the dentition, which does not guarantee generic identity. It may well be a member of an antecedent genus. *Merychippus* is the characteristic horse of the middle and late Miocene, unknown in the Arika-

reean, where its ancestor *Parahippus* flourished. But it is obvious that *Merychippus* did not spring full fledged from *Parahippus* at the ringing of a gong to announce an abrupt shift from the Arikareean to the succeeding stage. With increasing knowledge of deposits and fossils, increasing evidence of transitions in deposits and faunal elements are to be hoped for rather than feared. As suggested above, we may be witnessing at the Thomas Farm the actual transition from *Parahippus* to *Merychippus* and the facts can be fully accounted for by assuming that the deposit was formed at a relatively late date in the Arikareean.

Miocene sands and clays of the type found here are, in Florida, generally assigned to the Hawthorn formation, and such assignment was made for the Thomas Farm deposit in the earlier papers on the locality. The Hawthorn is considered to be of middle Miocene age, however, and the positive picture which our fauna gives of early Miocene Arikareean age has caused embarrassment. The Tampa limestone is the typical Florida formation of early Miocene age. White (1942) solves the difficulty by suggesting that the deposit was mainly laid down in Tampan time, but extending onward into the earlier part of the period of Hawthorn deposition. Cooke (1945) includes the deposit in the Tampan. There is, however, no published evidence of the presence of Tampan deposits in this part of Florida, and the bone pocket resembles in no way the typical Tampa limestone. Deposition was subsequent to that of the Suwannee limestone of late Oligocene age, since residua of that formation are present in the sediments; further, Ponton, cited by Simpson (1932: 12) states that limestone residua in the deposit also include a characteristic Tampa fossil, indicating that the site is post-Tampan as well.

White (1942), from a study of the areal distribution of Oligocene and Miocene sediments in Florida and adjacent states, concludes that in late Oligocene and early Miocene times this portion of Florida formed an island which became reconnected with the mainland in the middle Miocene; this situation, he suggests, offers an interpretation of certain problems connected with this fauna. Cooke (1945: 118) rejects the insular interpretation for a peninsular one, but without adequate discussion of the subject.

As noted in our introduction, one of the main interests in the study of such an eastern Tertiary deposit is the opportunity it gives to determine possible differences in faunas and environments between this major area of the continent and the western regions from which most of our existing knowledge has been obtained. Although much further

work can be and should be done at Thomas Farm, features of interest are already apparent and certain major contrasts are visible.

In any attempt, however, to contrast this fauna with that of the western Arikareean, caution must be observed. The western deposits of this age are from a variety of formations and areas, and the quantity of material, collected by many institutions over a period of many decades, is vast. We may hence reasonably assume that we have a moderately full sample of the contemporary mammal life of the West, although, as usual, plains dwellers are presumably much more adequately represented than forest animals. In this Florida deposit we are dealing with a much smaller body of material. It is highly improbable that we have as yet any approximation to the full list of forms actually present in the deposit. Every season's work, I believe, has added some new element to the list, and while future returns of novelties may be expected to diminish, there are unquestionably a number of rarer types still to be expected. Further, we cannot be sure that the animals who were entombed in this deposit were at all fully representative of the immediate locality, still less that they were representative of the possibly varied environments of the region as a whole.

Keeping all this in mind, we can, nevertheless, form some tentative conclusions.

That such groups as the insectivores and marsupials, rare in western deposits, have not been found at Thomas Farm, is probably meaningless. Rodents are abundant in variety in the western Arikareean. In contrast, only two types have been identified at Thomas Farm (there is a certain amount of unidentified fragmentary material). It is difficult to believe that there was any paucity of rodent life in the Florida Miocene; the situation may be due to the conditions of deposition at Thomas Farm.

Among the carnivores, the canids of Thomas Farm are comparable in variety and relative abundance to those of the same period in the West. It is of interest that there is as yet no trace of either procyonids —the raccoons and their relatives—or of any type of cat. However, both types are rather rare in the western Arikareean.

In certain respects the artiodactyl assemblage of Thomas Farm is similar to that of contemporary western deposits. Both contain peccaries, camels, hypertraguloids, and American "deer." However, camels are, thus far, very sparsely represented as compared with the Plains region, and most of the hypertragulids appear to be quite distinctive, not merely specifically but generically. A remarkable difference is in

regard to oreodonts (Merycoidodontidæ). These "ruminating hogs," so called, are extremely abundant and varied in the western Arikareean, making up a very considerable proportion of all museum materials from these beds. Not a single scrap of any oreodon has been as yet identified in the Thomas Farm material.

Of perissodactyls, tapirs and chalicotheres, present in the West, are not so far recorded at Thomas Farm. This may not be significant, for they are not too common in the Plains deposits. We are not as yet in a position to compare the rhinoceroses, present in both regions. The Thomas Farm horses are, as we have noted, those characteristic of the Miocene of the West. Their extreme relative abundance at Thomas Farm is of interest, for in the typical Arikareean the horses constitute a much smaller percentage of the material. Possibly this situation may be due to local conditions peculiar to the Thomas Farm deposit, but this is by no means certain.

Limited as our present knowledge is, there thus appear to be significant differences between the early Miocene fauna of Florida and that of the western plains. There is, further, a suggestion that this may be related to ecological as well as geographical factors.

Miocene Florida, like Florida today, was surely a low-lying country, little elevated above the sea. One tends to assume that the land was then something like that of today—well-watered, with abundant areas of forest and of lush plant growth.

The fauna, however, suggests the opposite. The most abundant elements in the fauna are dogs and horses. The Canidæ, as opposed to the felids and procyonids—absent so far from the Florida Miocene record—are, by and large, dwellers in open country. The early Tertiary horses were browsers and may well have been forest glade forms. But the dominant Florida mammals of the Miocene were progressive forms, *Parahippus* and *Merychippus*, which are universally interpreted as the initiators of the plains-dwelling habit characteristic of all late Cenozoic horses.

Equally significant appears to be the absence of oreodonts. These short-legged brachyodont ruminants are generally and reasonably interpreted as making their living on soft, lush vegetable material and thus to have been characteristically dwellers in swampy regions.

Tentatively then, we may conclude that Florida in the Miocene was a place far different from that which we see today. It was then, as now, a low country—but a low plain, relatively dry and grass-covered—a prairie in the western rather than the floridian sense of that term.

As I have tried to show above, the investigation—albeit as yet incomplete—of a single Florida fossil locality can yield results of interest and value to the vertebrate paleontologist. The total possibilities of the State have as yet been hardly scratched. So far most of the work has been done by out-of-state institutions or through private initiative; lack of funds and personnel have prevented state organizations from engaging in this task to more than a minor degree. It is to be hoped that future support may be given state institutions— University and Geological Survey—to enable them to participate actively in the study of this earlier Florida.

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